

CLAIMS

1. A solid polymer electrolyte fuel cell comprising: a plate-shaped electrode structure (7); and first and second separators (8, 9) that sandwich the electrode structure (7); the electrode structure (7) comprising a solid polymer electrolyte membrane (10); first and second electrode layers (11, 12) that sandwich the solid polymer electrolyte membrane (10); and first and second diffusion layers (13, 14) that are disposed outside the corresponding electrode layers (11, 12); the first separator (8) forming, in cooperation with a face on the first diffusion layer (13) side of the electrode structure (7), a first gas passage (P_H), one type of gas (H) among a fuel gas (H) and an oxidizing gas (A) flowing through the first gas passage (P_H); and the second separator (9) forming, in cooperation with a face on the second diffusion layer (14) side of the electrode structure (7), a second gas passage (P_A), the other type of gas (A) among the fuel gas (H) and the oxidizing gas (A) flowing through the second gas passage (P_A);

characterized in that the solid polymer electrolyte membrane (10) is formed so as to have a first jutting-out portion (15) that juts out from peripheries of the first diffusion layer (13) and the first and second electrode layers (11, 12), the second diffusion layer (14) is formed so as to have a second jutting-out portion (16) that juts out from the periphery of the second electrode layer (12) and faces the first jutting-out portion (15), the first and second jutting-out portions (15, 16) are joined together over the entire peripheries thereof via a cured adhesive layer (17), the second jutting-out portion (16) is in a state in which it is impregnated by cured adhesive, part of the surface of the first jutting-out portion (15) is set as an inlet area (a_3) and an outlet area (a_4) for said one type of gas (H), a seal (27) of the first separator (8) is in intimate contact with the surface of the first jutting-out portion (15) apart from the inlet area (a_3) and the outlet area (a_4) so as to form the first gas passage (P_H), part of the surface of the second jutting-out portion (16) is set as an inlet area (a_1) and an outlet area (a_2) for said other type of gas (A), a seal (21) of the second separator (9)

is in intimate contact with the surface of the second jutting-out portion (16) apart from the inlet area (a_1) and the outlet area (a_2) so as to form the second gas passage (P_A), the second electrode layer (12) surrounded by the cured adhesive layer (17) is separated from the cured adhesive layer (17), and the outer edge of the second electrode layer (12) is staggered relative to the outer edge of the first electrode layer (11) with the solid polymer electrolyte membrane (10) interposed therebetween.

2. A solid polymer electrolyte fuel cell comprising: a plate-shaped electrode structure (7); and first and second separators (8, 9) that sandwich the electrode structure (7); the electrode structure (7) comprising a solid polymer electrolyte membrane (10); first and second electrode layers (11, 12) that sandwich the solid polymer electrolyte membrane (10); and first and second diffusion layers (13, 14) that are disposed outside the corresponding electrode layers (11, 12); the first separator (8) forming, in cooperation with a face on the first diffusion layer (13) side of the electrode structure (7), a first gas passage (P_H), one type of gas (H) among a fuel gas (H) and an oxidizing gas (A) flowing through the first gas passage (P_H); and the second separator (9) forming, in cooperation with a face on the second diffusion layer (14) side of the electrode structure (7), a second gas passage (P_A), the other type of gas (A) among the fuel gas (H) and the oxidizing gas (A) flowing through the second gas passage (P_A);

characterized in that the solid polymer electrolyte membrane (10) is formed so as to have a first jutting-out portion (15) that juts out from peripheries of the first diffusion layer (13) and the first and second electrode layers (11, 12), the second diffusion layer (14) is formed so as to have a second jutting-out portion (16) that juts out from the periphery of the second electrode layer (12) and faces the first jutting-out portion (15), the first and second jutting-out portions (15, 16) are joined together over the entire peripheries thereof via a cured adhesive layer (17), the second jutting-out portion (16) is in a state in which it is impregnated by cured adhesive, part of the surface of the first jutting-out portion (15) is set as an inlet area (a_3) and an outlet area (a_4) for said one type of gas (H), a seal (27) of the first separator (8) is in

intimate contact with the surface of the first jutting-out portion (15) apart from the inlet area (a_3) and the outlet area (a_4) so as to form the first gas passage (P_H), part of the surface of the second jutting-out portion (16) is set as an inlet area (a_1) and an outlet area (a_2) for said other type of gas (A), and a seal (21) of the second separator (9) is in intimate contact with the surface of the second jutting-out portion (16) apart from the inlet area (a_1) and the outlet area (a_2) so as to form the second gas passage (P_A).

3. The solid polymer electrolyte fuel cell according to Claim 2, wherein the second electrode layer (12) surrounded by the cured adhesive layer (17) is separated from the cured adhesive layer (17), and the outer edge of the second electrode layer (12) is staggered relative to the outer edge of the first electrode layer (11) with the solid polymer electrolyte membrane (10) interposed therebetween.

4. The solid polymer electrolyte fuel cell according to Claim 2, wherein the first diffusion layer (13) has a third jutting-out portion (18) that juts out from the periphery of the first electrode layer (11), the third jutting-out portion (18) and the solid polymer electrolyte membrane (10) are joined together over the entire peripheries thereof via a cured adhesive layer (19), the third jutting-out portion (18) is in a state in which it is impregnated by cured adhesive, the cured adhesive layer (17) and the second jutting-out portion (16) on the second diffusion layer (14) side are formed so as to face the cured adhesive layer (19) on the first diffusion layer (13) side with the solid polymer electrolyte membrane (10) interposed therebetween, one section of a gas passage-forming part (26) of the first separator (8) is in intimate contact with the third jutting-out portion (18) of the first diffusion layer (13) over the entire periphery thereof, one section of a gas passage-forming part (20) of the second separator (9) is in intimate contact with the second jutting-out portion (16) of the second diffusion layer (14) over the entire periphery thereof, and the first electrode layer (11) is separated from the cured adhesive layer (19) surrounding the first electrode layer (11).

5. The solid polymer electrolyte fuel cell according to any one of Claims 1 to 4, wherein a portion of the second jutting-out portion (16) that corresponds to at least one area (a_1 to a_4) among the inlet areas (a_1 , a_3) and the outlet areas (a_2 , a_4) is in a state in which it is impregnated by cured adhesive.
- 5 6. The solid polymer electrolyte fuel cell according to any one of Claims 1 to 4, wherein the entire periphery of the second jutting-out portion (16) is in a state in which it is impregnated by cured adhesive.
7. A solid polymer electrolyte fuel cell electrode structure (7) comprising: a solid polymer electrolyte membrane (10); first and second electrode layers (11, 12) that
10 sandwich the solid polymer electrolyte membrane (10); and first and second diffusion layers (13, 14) that are disposed outside the corresponding electrode layers (11, 12);
the solid polymer electrolyte membrane (10) having a first jutting-out portion (15) that juts out from peripheries of the first diffusion layer (13) and the first electrode layer (11); and
15 the second diffusion layer (14) having a second jutting-out portion (16) that juts out from the periphery of the second electrode layer (12) and faces the first jutting-out portion (15), at least one portion of the second jutting-out portion (16) being in a state in which it is impregnated by cured adhesive.
8. The solid polymer electrolyte fuel cell electrode structure according to Claim
20 7, wherein the first and second jutting-out portions (15, 16) are joined together via a cured adhesive layer (17).
9. The solid polymer electrolyte fuel cell electrode structure according to Claim 7, wherein in the electrode structure (7) a portion of the second jutting-out portion (16) that corresponds to at least one area (a_1 to a_4) among inlet areas (a_1 , a_3) and
25 outlet areas (a_2 , a_4) for a fuel gas (H) and an oxidizing gas (A) is in a state in which it is impregnated by cured adhesive.
10. The solid polymer electrolyte fuel cell electrode structure according to Claim 7, wherein the entire periphery of the second jutting-out portion (16) is in a state in which it is impregnated by cured adhesive.

11. The solid polymer electrolyte fuel cell electrode structure according to any one of Claims 7 to 10, wherein the second electrode layer (12) surrounded by the cured adhesive layer (17) is separated from the cured adhesive layer (17), and the outer edge of the second electrode layer (12) is staggered relative to the outer edge of the first electrode layer (11) with the solid polymer electrolyte membrane (10) interposed therebetween.

12. The solid polymer electrolyte fuel cell electrode structure according to any one of Claims 7 to 10, wherein the first diffusion layer (13) has a third jutting-out portion (18) that juts out from the periphery of the first electrode layer (11), the third jutting-out portion (18) and the solid polymer electrolyte membrane (10) are joined together over the entire peripheries thereof via a cured adhesive layer (19), the third jutting-out portion (18) is in a state in which it is impregnated by cured adhesive, the cured adhesive layer (17) and the second jutting-out portion (16) on the second diffusion layer (14) side are formed so as to face the cured adhesive layer (19) on the first diffusion layer (13) side with the solid polymer electrolyte membrane (10) interposed therebetween, one section of a gas passage-forming part (26) of the first separator (8) is in intimate contact with the third jutting-out portion (18) of the first diffusion layer (13) over the entire periphery thereof, one section of a gas passage-forming part (20) of the second separator (9) is in intimate contact with the second jutting-out portion (16) of the second diffusion layer (14) over the entire periphery thereof, and the first electrode layer (11) is separated from the cured adhesive layer (19) surrounding the first electrode layer (11).